REMARKS

INTRODUCTION:

In accordance with the foregoing, claims 1, 5, 8 and 13 have been amended. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1, 4-5, 7-8, and 11-13 are pending and under consideration. Reconsideration is respectfully requested.

ENTRY OF RESPONSE UNDER 37 C.F.R. §1.116:

Applicants request entry of this Rule 116 Response and Request for Reconsideration because:

(a) it is believed that the amendments of claims 1, 5, 8 and 13 in accordance with the Examiner's suggestions, put this application into condition for allowance;

(b) the amendments were not earlier presented because the Applicants believed in good faith that the cited prior art did not disclose the present invention as previously claimed;

(c) the amendments of claims 1, 5, 8 and 13 should not entail any further search by the Examiner since no new features are being added or no new issues are being raised; and/or

(d) the amendments do not significantly alter the scope of the claims and place the application at least into a better form for appeal. No new features or new issues are being raised.

The Manual of Patent Examining Procedures sets forth in §714.12 that "[a]ny amendment that would place the case either in condition for allowance or in better form for appeal may be entered." (Underlining added for emphasis) Moreover, §714.13 sets forth that "[t]he Proposed Amendment should be given sufficient consideration to determine whether the claims are in condition for allowance and/or whether the issues on appeal are simplified." The Manual of Patent Examining Procedures further articulates that the reason for any non-entry should be explained expressly in the Advisory Action.

CHANGES TO THE SPECIFICATION:

The specification was objected to under 35 USC 132(a). The specification has been reviewed in response to this Office Action. Changes have been made to the specification only to place it in preferred and better U.S. form for issuance and to resolve the Examiner's objections raised in the Office Action. No new matter has been added.

In particular, as required by the Examiner, the paragraph beginning at page 8, line 1, has been amended to delete the terminology "non-gapped."

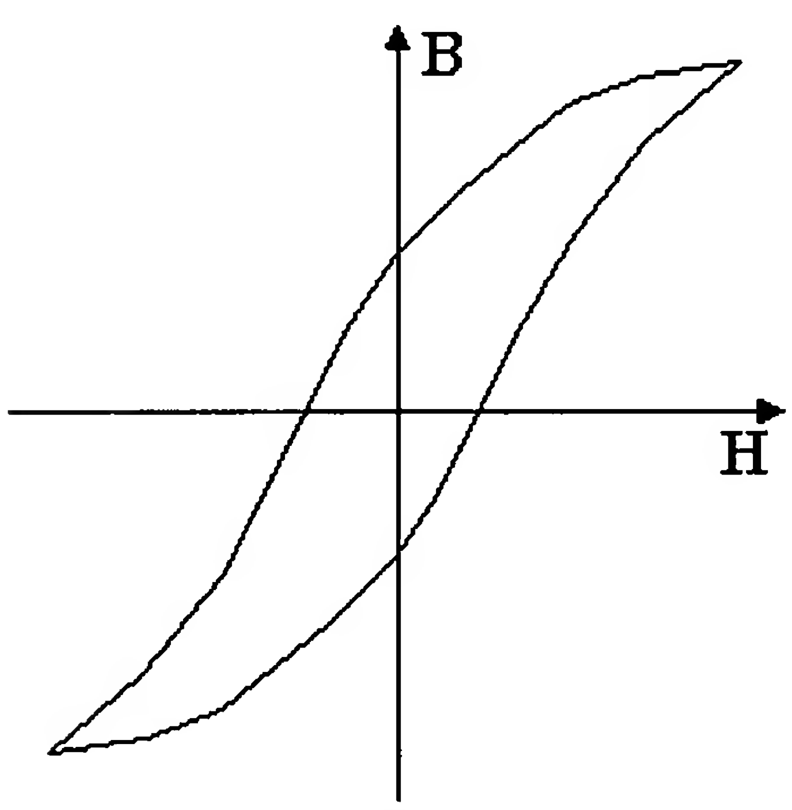
Hence, the paragraph beginning at page 8, line 1 is now submitted to be in allowable form under 35 USC 132(a).

REJECTION UNDER 35 U.S.C. §112:

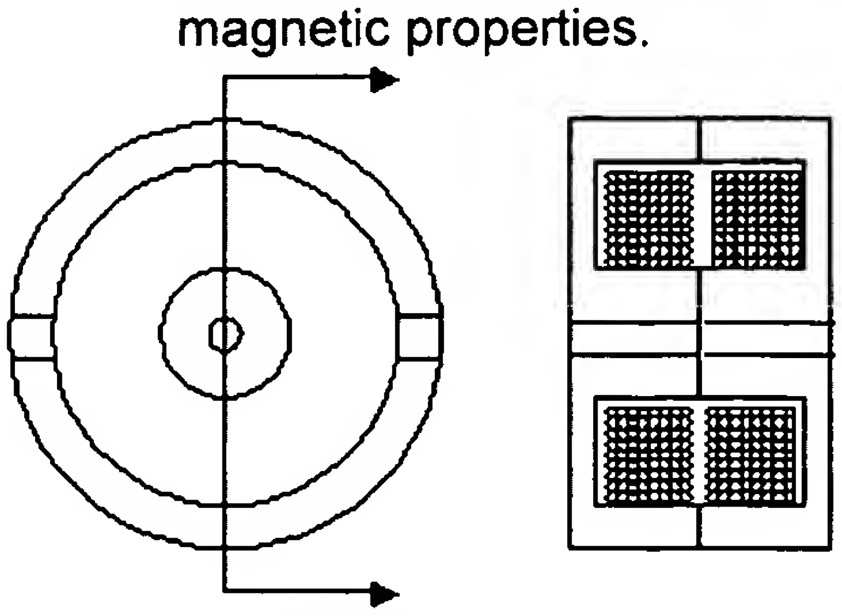
A. In the Office Action, at page 2, claims 1, 4-5, 7-8 and 11-13 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. This rejection is traversed and reconsideration is requested.

It is respectfully submitted that it is known to those skilled in the art that, when not specified otherwise, a core of a filter circuit, via default, has a gap of zero. For example, at http://www.d.umn.edu/~thom1417/out/spice/p6.html, the tutorial recites:

Nonlinear Core Model



Occasionally, we need to model some specific magnetic core material properties such as magnetic saturation and loss factors. This requires an additional statement in PSpice. The above figure shows a typical hysteresis loop of magnetic flux density, B, plotted as a function of magnetic field intensity, H. The effects of this can be modeled in PSpice for a specific sample of the core material with dimensions of the core and its nonlinear magnetic properties.



The above figure shows a typical ferrite "pot" core where the view on the left is the perspective one sees looking into an open core half, while the view on the right is a section view of a complete pot core transformer with two windings.

When specifying a nonlinear core, an additional PSpice statement is needed. This is the ".MODEL" statement. MODEL statements are required for most of the more complex parts used in PSpice. We will explain this by presenting an example and then dissecting its parts.

```
L1   1   2   25; <== 25 turns in winding
L2   3   4   50; <== 50 turns in winding
Knl L1 L2 0.98 my_core; <== "my_core" is a model name
.MODEL my_core Core(MS=400K A=45 C=0.4 K=25
+ AREA=1.38 PATH=4.52)
```

Several things are different about this example. First, the values after the node numbers in the "L1" and "L2" statements are the numbers of turns in the windings, instead of the inductance in henrys. This interpretation is triggered in PSpice whenever the inductor part name is mentioned in a "K" part listing that references a .MODEL statement. The next thing that is different is the model statement. All model statements have a similar form so that learning about this one will help you understand other model statements you will encounter later. The last item on the "K" part listing was the model *name* we are declaring. It is "my_core" in this instance. A model name does not have to start with any particular letter; i.e., you can use about any name you want as long as you avoid illegal characters such as embedded spaces. The .MODEL statement defines the model we are creating. Hence, the second item in the model statement is the model name. The third item in the model statement is the model *type*. In our case, this is "Core." There are many pre-defined model types in PSpice. The model type sets the rules on how to interpret the model parameters. In the "Core" model type, the parameters are: MS, the magnetic saturation in gauss; A, the thermal energy parameter in amp/meter; C, the domain flexing parameter (dimensionless); K, the domain anisotropy parameter in amp/meter; AREA, the cross-sectional flux area in cm^2; and PATH, the magnetic path length in cm. Since the format within the model statement is "parameter_name = value," the order of the parameters is not important. Since all the parameters have default values, they need not be entered if you are satisfied with the default. The "Core" model type has another parameter, GAP, which is the air gap length. It has a default value of zero, so we did not need to specify it in our example. (emphasis added)

Hence, it is respectfully submitted that it is known to those skilled in the art that a default value of an air gap length in a metal core is typically zero. Thus, it is respectfully submitted that the written description discloses an adequate written description of the non-gapped core.

Further references are submitted below to show the Examiner that it is known to those skilled in the art how gapped and non-gapped are readily identified:

BOZORTH (pages 9-10 and pages 838-845)

Fig. 1-10 on page 10 shows a ring with a slot (gapped core) with its "sheared" B-H curve showing the effect of the gap on the magnetization curve (B versus H). The "TRUE CURVE" refers to the B-H curve for a ring or toroidal core with no gap (non-gapped core). On pages 838-845, Bozorth gives BASIC RELATIONS among magnetic field and forces and methods of measuring them for different types of cores including ring-shaped (non-gap) and gapped cores (example: rods) with air gap. The flux in a closed circuit (for both gapped and non-gapped core) is given by the last equation on page 843. In this equation, u1 (Greek mu sub 1) is the permeability of a non-gapped core and l1 (Italic Roman el

sub 1) is the average circumference length of a ring (toroidal) core. When there is an air gap as in Fig. 1-10, l2 (Italic Roman el sub 2) is the air gap length. Fig. 19-2 illustrates how one measures induction B in a ring (toroidal) specimen as a function of applied field H. The quantity delta H in Fig. 1-10 is called "demagnetizing field" introduced in the magnetic circuit by the air gap. All of these are well-known facts to those skilled in the art.

CHIKAZUMI (pages 15-35)

Fig. 2.13 shows "two typical magnetic circuits", one for a gapped core (on the right) and the other for a non-gapped core. To illustrate the equivalence between an exciting current, i, and the magnetic field applied on the core, a permanent magnet is inserted in the core's gap region. The B-H characteristic measurement shown in Fig. 2.22 is identical to Fig. 19-2 of Bozorth, and the mathematical analysis given in this chapter is basically the same as that found on pages 838-845 in Bozorth's book. Problem 2.3 found on page 34 for a gapped core can be solved by using these mathematical formulas. This is a well-known problem which everybody skilled in the art generally has solved at least once in his or her lifetime.

JILES (pages 40-43)

Fig. 2.6 shows magnetic circuits: (a) closed (non-gapped) and (b) open (gapped). Jiles' subsequent description follows those of Bozorth and Chikazumi. For example, Jiles' last equation found on page 43 is equivalent to the last equation found on page 843 of Bozorth and to the equation to be found in Chikazumi's Problem 2.3

BOLL (page 80 and pages 206-207)

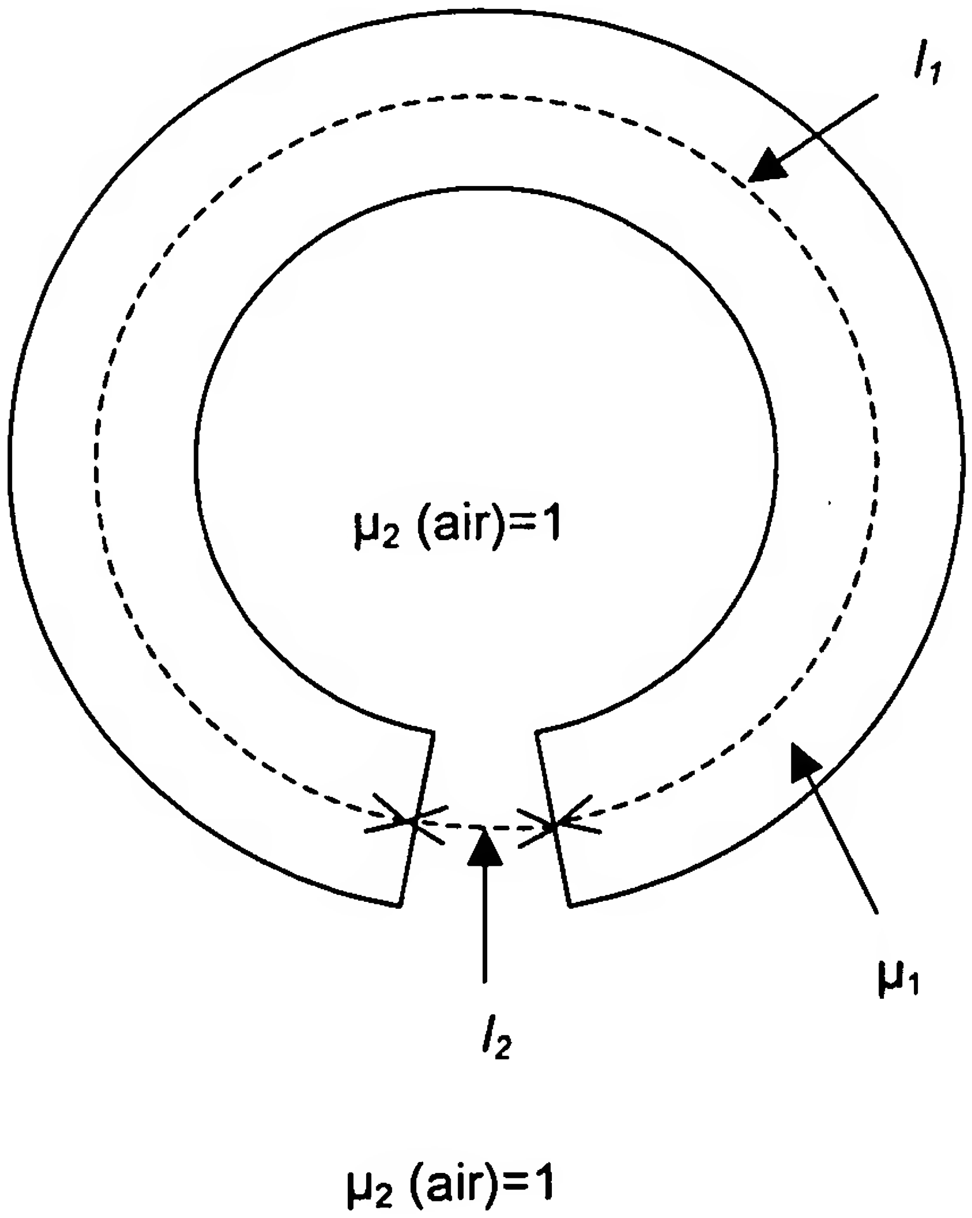
Page 80 gives examples of different forms of cores. The upper-top one is called "Ringbandkerne" (Ring Ribbon Core) which is a non-gapped core produced following the German Industrial Standard DIN 42311 (equivalent to European Standard IEC 635). Vacuumschmelze markets this product under the name of TRAFOPERM. The third one from the top is called "Schnittbandkerne" (Cut Ribbon Core) which is a gapped core produced according to DIN 41309 (IEC 329). In the Section 10.2.4 "Bandkerne in Sonderformen" (Ribbon Core in Other Forms) found on pages 206-207, one find "Ringkern mit Luftspalt" (Ring Core with Air Gap or Gapped Core) in Bild (Fig). 10.10. Vacuumschmelze markets this type of cores under the trade name of PERMENORM.

As noted above, the difference between a "gapped" and a "non-gapped" core is that the former has a physical gap with a clearly marked air gap while the latter does not. This

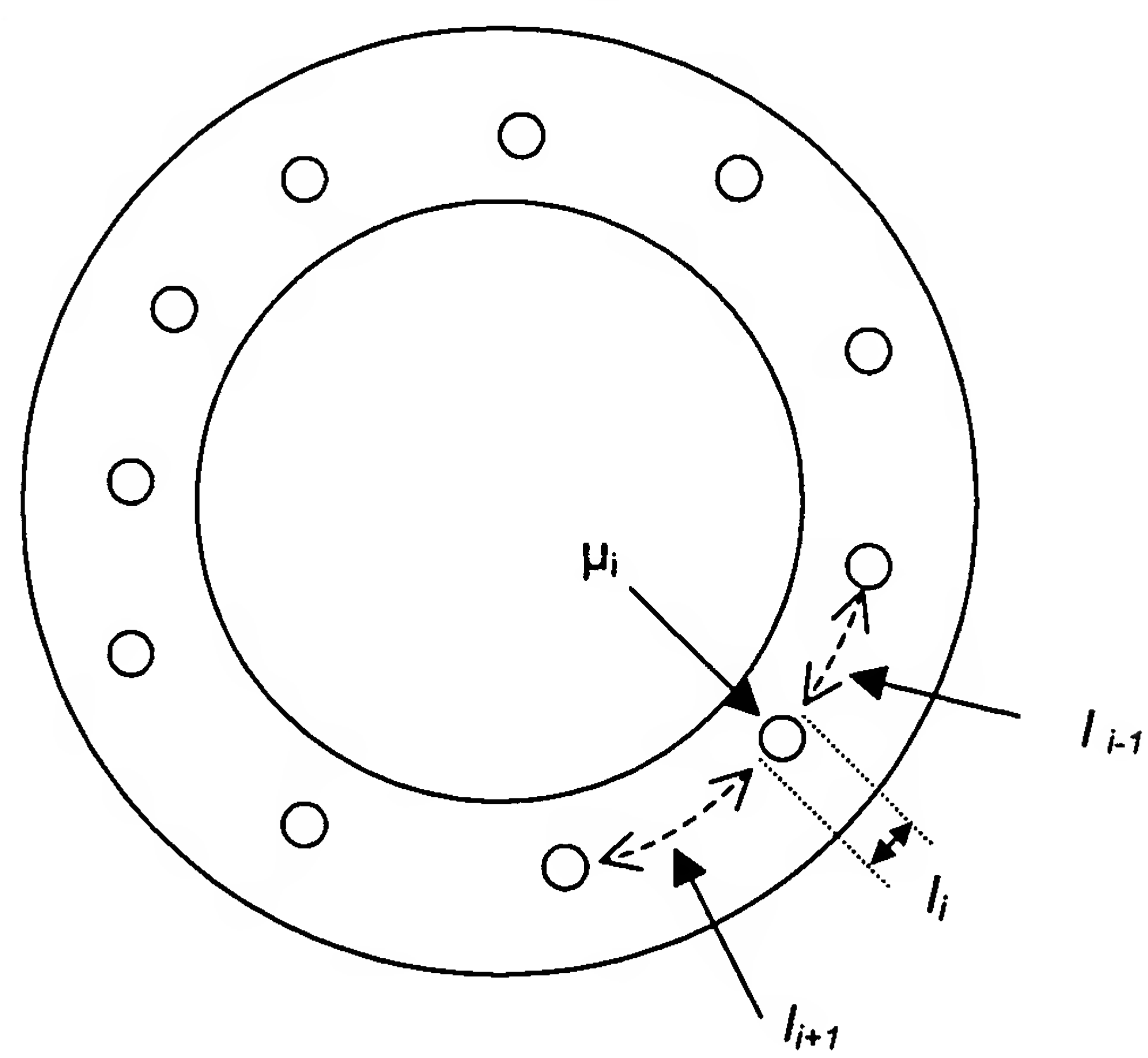
type of core was referred to as a core with a discrete gap in the specification (see line 30 page 5). In a physically "non-gapped" core, a distributed gap can be introduced by partially crystallizing an amorphous alloy (see line 31 on page 5 of my application) without having a discrete physical gap. <u>This is still called a non-gapped core because there is no physical gap</u>. Thus, it is respectfully submitted that a clear description of a non-gapped core without a discrete physical gap is given in this application, contrary to what the Examiner submits. This is supported by the paragraph just mentioned (i.e., the paragraph starting on line 30 of page 5) and Fig. 12 which shows the crystalline phase particles precipitated by the heat-treatment utilized in Figs. 7-9 and 13. These crystalline particles embedded in an amorphous matrix function as the distributed gap. It is respectfully submitted that those skilled in the art understand the above difference between a (physically) gapped and a (physically) non-gapped core in light of the mathematical analysis (based on the physics involved) of the magnetic properties of these cores can easily see that the cores of the present invention are indeed non-gapped. Another example of a non-gapped core with a distributed gap is given by pressed powder and ferrite cores (see pages 498-499 of Chikazumi). These cores are based on magnetic powders compressed into final shapes with insulating materials which function as distributed magnetic gaps.

In addition, a difference between a gapped core with a discrete gap and a distributed gap core with no gap may be clarified as follows. First, see the illustration below.

<u>Gapped Core with a Discrete Gap</u>



<u>Non-gapped core with distributed gaps</u>



In the above illustration, μ_i is the magnetic permeability of i-th magnetic material with a magnetic path length of l_i. Now using the formula

$$\varphi = F/R = F/(R_1 + R_2 + \ldots) = F/(l_1/\mu_1 A_1 + l_2/\mu_2 A_2 + \ldots\ldots)$$

found on page 843 of the book by Bozorth, the following argument is presented. In the above formula, the definitions of the quantities such as F, R_i, l_i, μ_i and A_i are the same as in Bozorth's book (published in 1951). Also referring to the paragraph in the specification: "The gap can be discrete or distributed. A distributed gap can be introduced by using ferromagnetic powder held together with nonmagnetic binder or by partially crystallizing an amorphous alloy." (see line 30 on page 5 of the application).

1. Gapped Core with a Discrete Gap (see above illustration on the left)

In this case, a discrete gap is air having a permeability of $\mu_2 = 1$, with its length l_2 as shown. The main magnetic path is indicated by l_1 which has a permeability of μ_1. The magnetic flux φ of the magnetic circuit of the gapped core can be calculated by using the formula given above.

2. Non-gapped Core with Distributed Gap (see above illustration on the right)

In the above illustration which is simplified but with no loss of generality, circles represent crystalline phases created by partial crystallization of an ungapped core. The partial crystallization procedure is shown in Fig. 9 of the application, and the resultant magnetic properties of the ungapped cores are given in Figs. 7, 8, 10, 11 and 13 of application. Fig. 12 of the application shows the microstructure of a partially crystallized section of the core. As shown, the crystalline phase particles are distributed randomly. In the above illustration, an i-th crystalline particle has a permeability of μ_i and a magnetic length of l_i. Since the crystalline particles have some distribution in size, l_i has a distribution reflecting this. This results in the distribution of particles' permeabilities, μ_i. Also the distance between the particles, denoted by l_i, varies from place to place. Thus, the magnetic flux φ of the magnetic circuit of the non-gapped core with distributed gap becomes

$$\varphi = F/(l_1/u_1 A_1 + \ldots l_{i-1}/\mu_{i-1} A_{i-1} + l_i/\mu_i A_i + l_{i+1}/\mu_{i+1} A_{i+1} + \ldots\ldots),$$

following the formula of Bozorth.

Hence, it is respectfully submitted that, as argued above, the non-gapped core of the present invention is submitted to be clearly described in the specification, contrary to the Examiner's

assertion.

With respect to the terminology "a substantially constant permeability to within 10% of the permeability at 1kHz over a frequency range about 1 to 1000 Hz," it is respectfully submitted that it is clear to one skilled in the art that FIG. 4A , which is "a graph depicting permeability of a core of the invention as a function of applied frequency" (see Brief Description of Drawings), clearly illustrates a substantially constant permeability to within 10% of the permeability at 1kHz over a frequency range about 1 to 1000 Hz.

Thus, it is respectfully submitted that claims 1, 4-5, 7-8 and 11-13 are in allowable form under 35 U.S.C. §112, first paragraph, and comply with the written description requirement.

B. In the Office Action, at pages 2-3, claims 1, 4-5, 7-8 and 11-13 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. This rejection is traversed and reconsideration is requested.

The Examiner submits: "Applicant fails to provide enablement for the non-gapped core and the core having 'a substantially constant permeability to within 10% of the permeability at 1 kHz over a frequency range of about 1 to 1000 kHz'." It is respectfully submitted that the specification is enabling with respect to the non-gapped core (see arguments above).

It is respectfully submitted that paragraph [0036] of the published specification recites:

> [0036] FIG. 4A is a graph depicting the functional relationship between core permeability and applied field frequency for a bandpass filter of the invention. An alternating current (AC) signal is applied to a bandpass filter having a core consisting essentially of an Fe-base amorphous metal alloy with a permeability of approximately 700. The frequency is varied over a range of 1-10,000 kHz while the permeability is measured. The graph indicates that the permeability is constant up to about 1000 kHz range. The permeability then gradually decreases linearly from 700 to 20 as the frequency is varied from 1000 kHz to 20,000 kHz.

> MPEP 2111.01 states: During examination, <u>the claims must be interpreted as broadly as their terms reasonably allow</u>. *In re American Academy of Science Tech Center*, **>367 F.3d 1359, 1369, 70 USPQ2d 1827, 1834 (Fed. Cir. 2004)< (The USPTO uses a different standard for construing claims than that used by district courts; during examination the USPTO must give claims their broadest reasonable interpretation.).... One must bear in mind that, especially in nonchemical cases, the words in a claim are generally not limited in their meaning by what is shown or disclosed in the specification. See, e.g., *Liebel-Flarsheim Co. v. Medrad Inc.*, 358 F.3d 898, 906, 69 USPQ2d 1801, 1807 (Fed. Cir. 2004)(discussing recent cases wherein the court expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment). (emphasis added)

> MPEP 2173.05(a) recites: The meaning of every term used in a claim should be apparent from the prior art or from the specification and drawings at the time the application is filed. (emphasis added)

It is respectfully submitted that the description of FIG. 4A, together with FIG. 4A itself, clearly are enabling to one skilled in the art with respect to the terminology "the core having 'a substantially constant permeability to within 10% of the permeability at 1 kHz over a frequency range of about 1 to 1000 kHz'." However, independent claims 1, 5, 8 and 13 have been amended for clarity.

Hence, Applicants submit that claims 1, 4-5, 7-8 and 11-13 meet the requirements of 35 U.S.C. § 112, first paragraph, and comply with the enablement requirement. Accordingly, Applicant respectfully requests withdrawal of the rejection to the claims under § 112, first paragraph and acknowledgement that claims 1, 4-5, 7-8 and 11-13 comply with the enablement requirement.

C. In the Office Action, at page 3, claims 1, 4-5, 7-8 and 11-13 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection is traversed and reconsideration is requested.

The Examiner submitted that claims 1, 5, 8 and 13 should be clarified with respect to the "non-gapped" structure of the core and what is intended by "a substantially constant permeability to within 10% of the permeability at 1kH over a frequency range about 1 to 1000 kHz." Applicants thank the Examiner for his suggestion.

Claim 1 has been amended as follows:

> A bandpass filter, comprising an inductor having a non-gapped core that consists essentially of an Fe-based amorphous metal alloy ribbon, a linear BH loop, and has a substantially constant permeability, ± about 5%, ~~to within 10% of the permeability at 1 kHz~~ over a frequency range of about 1 to 1000 kHz.

As suggested by the Examiner, claims 5, 8 and 13 have been amended similarly. These amendments are based on at least FIGs. 3 and 4A, together with the descriptions in the specification with respect thereto.

In view of the above arguments, claim 12 is submitted to be in allowable form under 35 U.S.C. §112, second paragraph, to be definite, and to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Since the Examiner did not suggest amending claim 12, it is respectfully submitted that it may simply have been a typographical error to include claim 12 in the rejection under 35 U.S.C. §112, second paragraph.

It is respectfully submitted that amended independent claims 1, 5, 8, and 13 are now in allowable form under 35 U.S.C. §112, second paragraph, are definite, and particularly point out and distinctly claim the subject matter which applicant regards as the invention. Since claims 4, 7 and 11 depend from amended independent claims 1, 5 and 8, respectively, claims 4, 7 and 11 are in allowable form under 35 U.S.C. §112, second paragraph, are definite, and particularly point out and distinctly claim the subject matter which applicant regards as the invention for at least the reasons amended independent claims 1, 5 and 8 are in allowable form under 35 U.S.C. §112, second paragraph, are definite, and particularly point out and distinctly claim the subject matter which applicant regards as the invention.

CONCLUSION:

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited. At a minimum, this Amendment should be entered at least for purposes of Appeal as it either clarifies and/or narrows the issues for consideration by the Board.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited and possibly concluded by the Examiner contacting the undersigned attorney for a telephone interview to discuss any such remaining issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: October 18, 2006 By: Darleen J. Stockley

Darleen J. Stockley
Registration No. 34,257

1201 New York Avenue, N.W.
Suite 700
Washington, D.C. 20005
Telephone: (202) 434-1500
Facsimile: (202) 434-1501